

Distribution of Free-living Soil Nematodes of the Belondiroidea in Indiana and the United States¹

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Abstract

During a 5-year study of distribution of soil and fresh-water nematode species in Indiana, four genera of the Belondiroidea have been found widely distributed in natural areas of the state. Of these, *Dorylaimellus* Cobb, *Axonchium* Cobb, and *Oxydirus* Thorne were found in most biotic units of the state. In subsequent sampling in widely separated areas of the U. S., *Dorylaimellus* and *Axonchium* were found in natural areas in all sections of the country sampled. Species of *Oxydirus* were found less frequently and appeared in only one collection in western U. S., a forest meadow in Sequoia National Park, California. Although four species of *Belondira* Thorne were well-distributed in southern Indiana, only two were found as far north as Tippecanoe County. Despite extensive sampling throughout the U. S. we have recovered specimens of this genus from a very limited geographic area, extending only from eastern Kansas to Tennessee.

Introduction

The nematode superfamily Belondiroidea as presently understood by most authorities consists of eight families and 13 genera (3). Of these, only five genera, one in each of five families, have been reported from continental United States: *Dorylaimellus* Cobb in the Dorylaimellidae; *Axonchium* Cobb in the Axonchiidae; *Oxydirus* Thorne in the Oxydiridae; *Belondira* Thorne in the Belondiridae; and *Swangeria* Thorne in the Swangeriidae. All contain stylet-bearing soil species whose food habits are largely unknown. Some may be plant parasitic, although they are not generally found in large numbers around cultivated plants at least in temperate regions. For this reason they have been studied very little.

Dorylaimellus virginianus Cobb was originally found by Cobb (2) in Virginia and subsequently also in Utah by Thorne (8). Other species of *Dorylaimellus* were found by Thorne (8) and Cobb (2) in Virginia, Idaho, Utah, Texas, and Colorado; and by Orr and Dickerson (7) in Kansas. A wide distribution for species of *Axonchium* was recorded by Thorne (8) when he reported their occurrence in Utah, Colorado, Missouri, Washington, D. C., Georgia, South Carolina, and Florida. More recent collections were noted by Orr and Dickerson (7) in Kansas and by Hechler (5) in Virginia. *Oxydirus* spp. were reported from Utah and Virginia by Thorne (8), and Hechler (4) reported finding *Oxydirus gangeticus* Siddiqi in Maryland. A single species of *Belondira* (*B. apitica* Thorne) was found by Thorne (8) in Utah, and this species plus another were found by Orr

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and Dickerson (7) in Kansas. *Swangeria bisexualis* Hopper was described (6) from a series of 10 specimens taken in Florida.

Despite the fact that the occurrence of belondiroid nematodes in the U. S. has been infrequently noted by nematologists, we found four of the five genera discussed above to be common in Indiana. Subsequent sampling over the rest of the country indicated that these four genera differ from each other in their biogeography. The present report concerns the distribution of genera only. Detailed studies of the species found within each genus will follow in later papers.

Methods

Intensive sampling of natural sites within the biotic units of Indiana (1) was carried out over a 5-year period. Sites were usually wooded and often included a stream or river. The number of samples taken at any given time from a specified area varied from 6 to 50, but most areas were sampled several times at different seasons of the year. Three 3-liter samples were collected from each site. One sample was collected from the edge of the stream or river using a 2.5 cm sampling tube thrust 15-20 cm into the soil, whenever possible. Approximately 50 such cores were collected for a distance of 30 m along the contour of the stream. A second such sample was taken from the normal flood plain, but away from the stream edge; and a third sample was taken well outside the normal flood plain. Additional samples were taken in specialized and typical habitats in all areas. Detailed ecological data were recorded at the time of sampling including information about flora of the area, soil type, soil contour, soil moisture, and other factors. Samples from other parts of the United States were collected in a manner similar to that used for Indiana samples.

In the laboratory one 1-liter subsample was processed from each sample by a combination of sieves and Baermann funnels. Nematodes were relaxed by gentle heat (57°C for 10 min.) and killed and fixed in F. A. A. (9). A "profile" of all species present was established for each sample and the specimens processed to permanent glycerine mounts by the Thorne slow method (9).

Results and Discussion

The occurrence of representatives of these four genera in our collections is shown on the maps, Figure 1 (Indiana) and Figure 2 (the U. S.). *Dorylaimellus* species are common throughout Indiana and are present in all areas of the U. S. we have sampled. The same generalization may be made about *Axonchium*, although it should be noted that we have recovered fewer species of *Axonchium* than of *Dorylaimellus* (3). Nematodes belonging to the genus *Oxydirus* are found in all parts of Indiana, although they were less numerous than nematodes of the former two genera. *Oxydirus* specimens appeared in only one collection in western U. S., a forest meadow in Sequoia National Park, California.

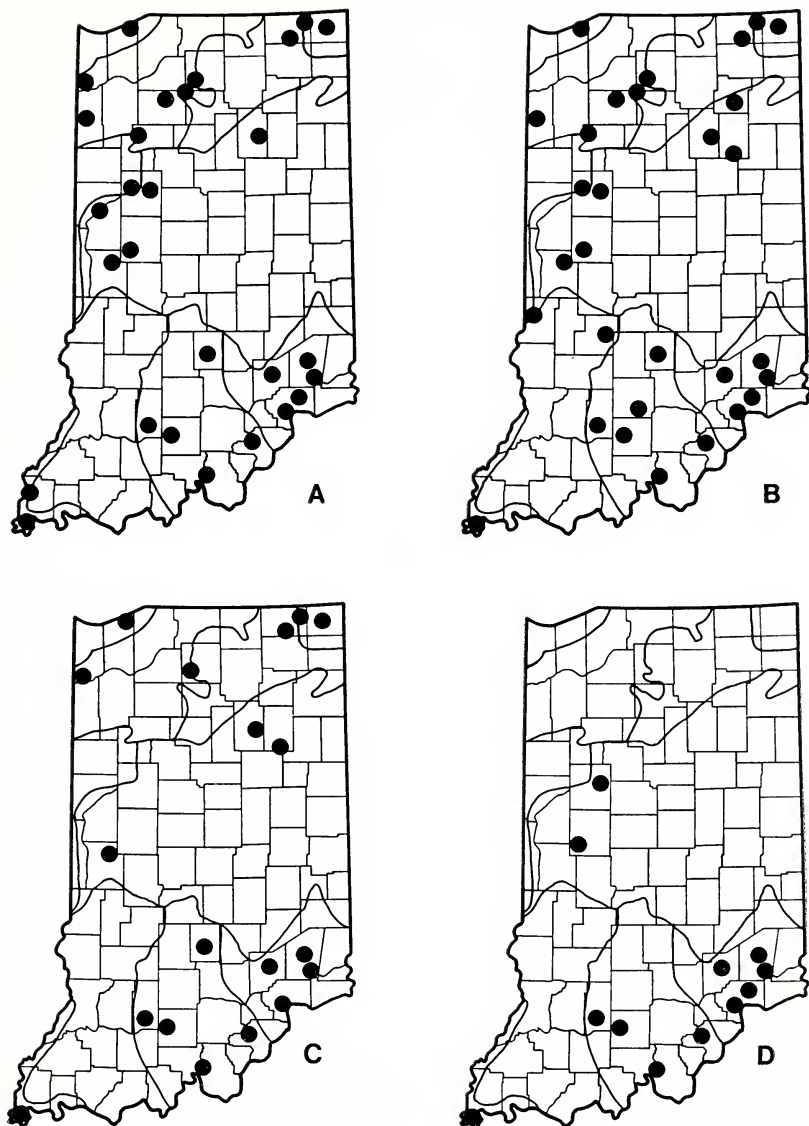


FIGURE 1. Distribution of four genera of the Belondiroidea in Indiana (map is divided into biotic units of Chandler (1)). A, *Dorylaimellus*; B, *Axonchium*; C, *Oxydirus*; D, *Belondira*.

Although four species of *Belondira* are well-distributed in the southern part of Indiana, only two species were found as far north as Tippecanoe County. Despite a vigorous search for representatives of this genus throughout the U. S., we have recovered specimens from a very limited geographic area, extending only from eastern Kansas to Tennessee.

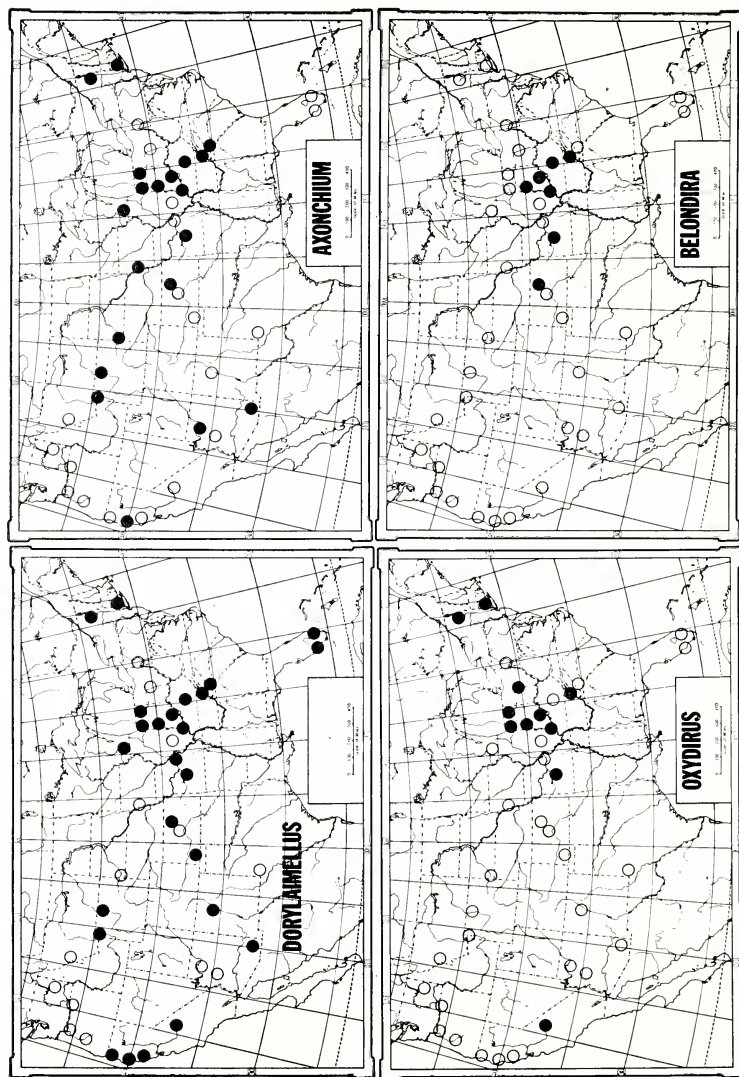


FIGURE 2. Distribution of four genera of the Belondiroidea in the United States. Open circles indicate sites sampled, and solid circles show where a given genus was found.

Conclusions

Although members of the Belondiroidea have never been reported from many areas of the new world, it appears that the genera *Dorylaimellus* and *Axonchium* are widely distributed and common throughout the U. S. *Oxydirus* appears to be less widely distributed, especially in the western states, and the genus *Belondira* appears to be restricted in distribution.

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